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Arduino Controlled Wild Animal Repellent System for Use in Farming

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ABSTRACT

In addition to the problems encountered in the production and cultivation of agricultural products, protection from wild animals is one of the important problems of today. Wild animal repellent systems used today work with the logic of making sounds and scaring them at certain time intervals. Although these systems become the usual sounds for living things over time, living things become insensitive to this sound. The fact that agricultural lands are generally large environmentally makes it difficult to protect them physically. With the development of microprocessor technology, automatic systems have gained importance in terms of this type of control. In this study, an automatic system that provides environmental control of agricultural lands by using laser lights and flat mirrors has been realized. The system is realized with arduino control from a single point. The energy requirement of the system is quite difficult considering the field conditions. Therefore, solar charge control is included in the system.

KEYWORDS: *Quard, Wild animal, Farming, Protected*

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1. INTRODUCTION

Since the existence of humanity, the agricultural sector is an indispensable source of finance for the countries in the world [1, 2]. For this reason, with the development of technology, the use of technology in agriculture affects the agricultural sector positively. The increase in agricultural areas with the developing agricultural sector narrows the areas where other living things continue their positioning and life cycle. For this reason, a habitat-based competition environment occurs between farmers and wild or non-wild creatures [3].

The biggest problem of people dealing with animal husbandry is the struggle with wild animals. Because the biggest threat to the sheep, goats and calves, which are taken out for a walk under the supervision of a shepherd and to meet their nutritional needs, are wild animals. The threat posed by wild animals is increasing, especially due to the width of the areas where such animals are grazed and the difficulty of control [4].

Taşkın, et al. [3] in this study, they defined the physical and biological structures of wild animals. In order to be protected from wild animals, they proposed two methods, active and passive, which are determined by considering the physical and biological structures of these wild animals. Passive Control method is defined as non-lethal wild animal control methods. In this method; fencing, maternity pens, day grazing, night herd closure, scare/deterrent methods, removal of dead and other waste, reformed animals culling, frequent herd overhaul, habitat control, king collar, guard dogs, llamas and donkeys and multiple methods. Active control method is defined as lethal methods in wild animal control. In this method; cable traps, trapping, steel foot traps, live traps or cages, containment, wildlife killing, M-44 (Sodium Cyanide) and protective collars [3].

Sağlam, et al. [5] with this study, it has been determined whether the bear losses have actually increased, and the possible causes of such an increase, if any, have been tried to be emphasized and the necessary measures to control the damage have been examined. As a result of the determinations made, it has been revealed that bears generally harm beehives,

domestic animals, agricultural fields and finally humans. It has been understood that the most intense damage is given to agricultural areas and beehives.

Allen and Hampton [6], carried out a study in order to minimize the damage of wild animals that harm the work of people engaged in agriculture and animal husbandry. As a result of these studies, they concluded that living together with wild dogs or dingoes in large pastures or in the farmer's animal habitat will have a deterrent effect against wild animals. Thus, balancing the population density of wild dogs or dingoes with damaging wildlife shows how adverse effects can be minimized among both wild and domesticated species found on a farm or free-range grazing.

2. DESCRIPTION OF SYSTEM

With this study, a system was created that allows the area to be protected from a single center to be controlled.

In this developed system, mirrors are placed at the corners of the area to be protected. From the control point, laser beams are sent to these mirrors placed at the corners, and the laser beam reflected from the mirrors is returned to the receiver at the center point (Figure 1). With this method, when any object entering the area to be protected cuts the laser beam, it is understood that a foreign object has entered and the warning system is activated.

The usage pattern of this study on the protected area in field conditions is as in Figure 1.

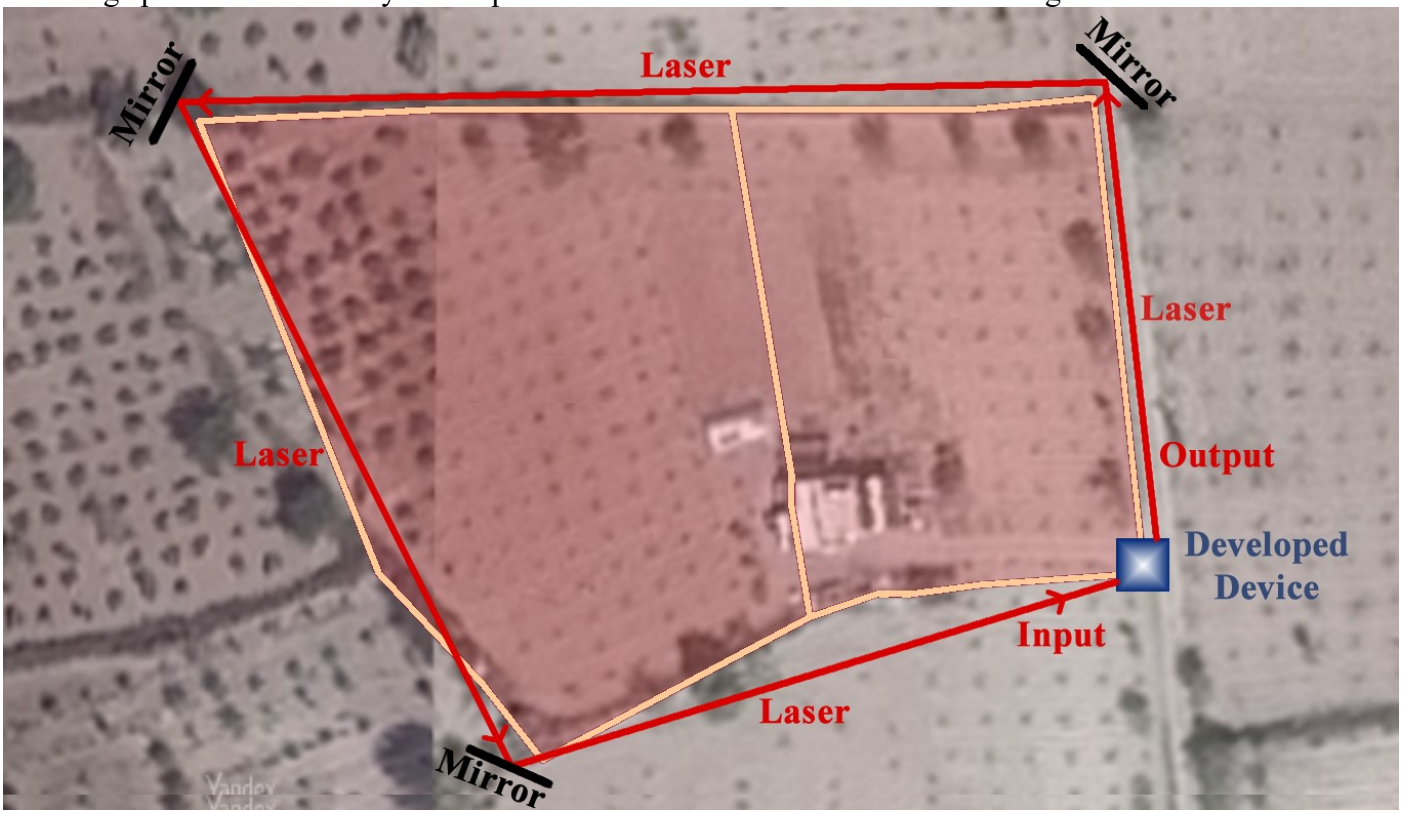

Figure 1 Application area of the developed system

The system proposed in this study consists of four basic parts (Figure 2). These include:

- Power Unit,
- Transmitter Unit,
- Receiver Unit,
- Control Unit.

In order to provide an uninterrupted energy requirement for the developed system, it is met from solar energy. The energy taken from the solar energy panels is converted into a form that can be used by the Control Unit, Transmitter Unit and Receiver Unit by the Power Unit.

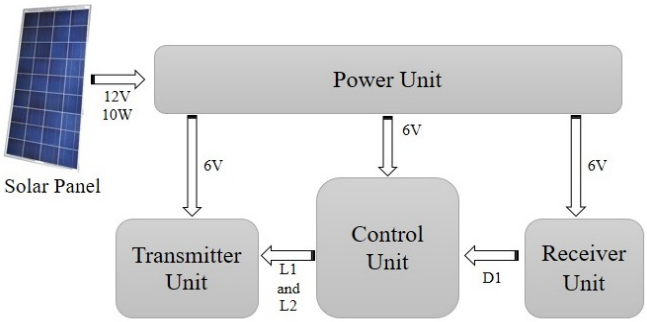

Figure 2 The block diagram of the Arduino Controlled Wild Animal Repellent System for use in Farming

2.1. Power Unit

The power requirement of the implemented system is provided by the power unit. It is obtained from the sun, which is the main source so that the power of the system is not interrupted. For this reason, a solar panel with a power of 10 watts and 12 volts was used in the system to benefit from solar energy. The circuit established with the LM317 in Figure 3 was created to charge the 6 volt battery with the 12 volt coming from the solar panel.

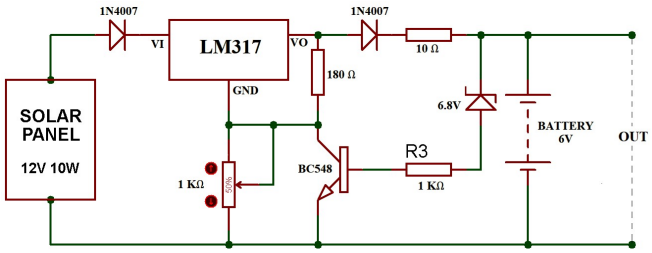

Figure 3 Power unit

The voltage obtained from the solar panel with a voltage of 12 volts charges the battery with a voltage of 6 volts, and the battery with a voltage of 6 volts provides the power requirement of the Transmitter Unit, Receiver Unit and Control Unit.

2.2. Transmitter Unit

In the continuous use of laser heats, either the lifetime of the lasers is shortened or they are deteriorated by overheating. For this reason, instead of continuous use of lasers, it is preferred to use pulsed or resting for a certain period of time [7-10].

In the developed system, two laser lights were used to scan the designated area to protect it from wild animals (Figure 4).

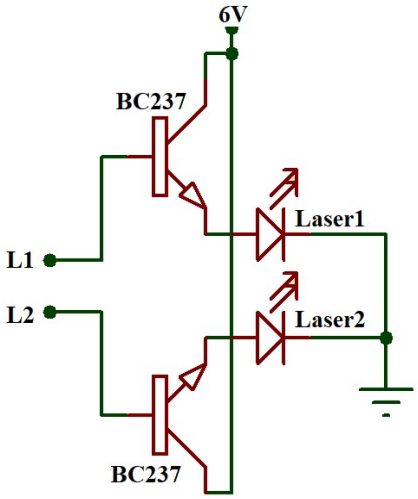

Figure 4. Transmitter unit

L1 and L2 pins and BC237 transistors are triggered by Arduino in the control unit, and lasers are operated with 6 volts coming from the power unit.

Laser1 and Laser2 in the transmitter unit are programmed to operate for %50 of the time. That is, within a minute, Laser1 works for 30 seconds and Laser2 for 30 seconds. Thus, the lasers used in the realized system are protected.

2.3. Receiver Unit

In the implemented system, the laser beams sent from the transmitter unit are received and read by the LDR (Light Dependent Resistor) in the receiver unit in Figure 5. The intensity of the light read by the LDR is sent to the control unit for evaluation with the pin D1.

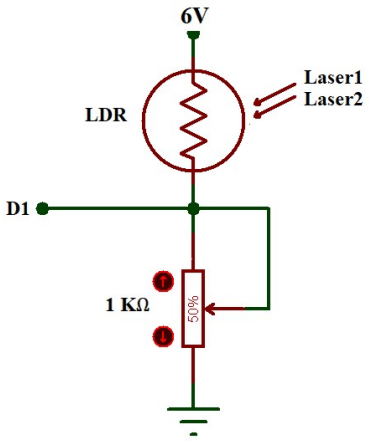

Figure 5. Receiver unit

It is operated with 6 volts coming from the LDR power unit in the receiver unit. The reading intensity of the laser light coming to the LDR in the receiver unit is determined by the 1KΩ potentiometer.

2.4. 2.4. Control Unit

The implemented system is controlled by the Arduino in Figure 6.

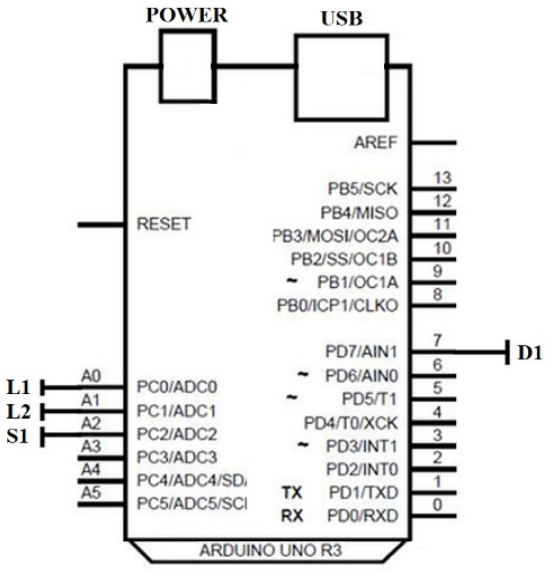

Figure 6. Control unit

The power of the Arduino in the control unit is provided by 6 volts from the power unit. L1 and L2 pins and Lazer1 and Lazer2 are operated at 30 second intervals. With the D1 pin, the value of the LDR used to read the laser beams is read. If there is any interruption during the reading of the LDR, the siren connected to the S1 pin is operated for 1 minute, thus frightening the wild animal.

3. CONCLUSIONS

In the literature, there are systems that work, explode or make noise at certain intervals in order to protect against wild animals. These systems desensitize these animals to these stimuli. For this reason, although it is useful at first, it does not work after a few times.

In the system developed in this study, farmers protect their crops or shepherds' animals. Although this study is similar to the studies in the literature, its biggest advantage is that it warns the harming wild animal every time it enters the protection area. Thus, while the wild animal that harms the systems in the literature remains insensitive after a few times, with this developed system, the wild animal that harms the protected area is warned each time it enters. Thanks to this advantage, this study is more applicable than the studies in the literature.

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